MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2019/2020

TCP1121 – COMPUTER PROGRAMMING

(All sections / Groups)

19 October 2019
2:30 p.m – 4:30 p.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of 6 pages with 4 questions only.

2. Attempt **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Write your answers in the Answer Booklet provided.

Question 1 [10 Marks]

a) The C++ code below is a simple program that prompts the user to enter positive integers. The loop stops when user entered a negative integer. The smallest integer that the user entered will be shown. Draw a complete flow chart based on the code below. [5 Marks]

```
int main(){
    int num, smallest = -1;
    do{
        cout << "Enter positive integer : ";
        cin >> num;
        if(num >= 0){
            if ((num < smallest) || (smallest < 0)){
                smallest = num;
            }
        }
    }while (num >= 0);
    cout << "The smallest integer is " << smallest;
    return 0;
}
```

b) Write the output of the following C++ program.

i) [1 Mark]

```
int arr[5]={1,3,7,9};
int i;
for(i=0;i<3;i++)
    cout<<arr[i]*arr[i+1]<<"\t";
```

ii) [1 Mark]

```
int *p1, *p2;
p1 = new int;
*p1 = 50;
p2 = p1;
cout << *p1 << "\t" << *p2 << endl;

*p2 = 99;
cout << *p1 << "\t" << *p2 << endl;
```

iii) [2 Marks]

```
float a = 5.2;   //global variable declaration

float display(float a){
    return a*2;
}

int main(){
    cout << "a = " << a << endl;
    int b = a;
    cout << "b = " << b << endl;
    cout << "c = " << display(a) << endl;
    cout << "a = " << a << endl;
    return 0;
}
```

Continued.....

iv)

```
int fun(const int x=10){
    return x;
}

int main(){
    const int a=100;
    cout<<"First call: " << fun() << endl;
    cout<<"Second call: "<< fun(a) << endl;
    return 0;
}
```

[1 Mark]

Question 2 **[10 Marks]**

a) The following program prompts a user to enter five integer score values and store into an array. It then calls a function `calAverage()` to calculate the average of five integer values. Another function `findMax()` will be called to find and return a maximum value from the integer values.

```
int main(){
    int score[5] = {0}, maxValue;
    double average;

    (i) By using for…loop, get 5 integer values from a user

    // calculate average
    calAverage(score, average);
    cout << "The average is " << average << endl;

    maxValue = findMax(score);
    cout << "The maximum value is " << maxValue << endl;
    return 0;
}
```

Sample Output

```
Enter score 1: 5
Enter score 2: 8
Enter score 3: 3
Enter score 4: 6
Enter score 5: 4

The average is 5.2
The maximum value is 8
```

Continued.....

i) By using a `for...loop` structure, get 5 integer score values from the user and store them into an array `score`. [2 Marks]

ii) Complete the function `calAverage()` to calculate the average of the score values. [2 Marks]

iii) Complete the function `findMax()` to find the maximum value from the integer values. [2 Marks]

b) The following program prompts a user to enter the size of a floor in meter square and the length and width of a tile. The program then will calculates total number of tiles needed to cover the entire floor. The equation to calculate number of tiles is defined as below:

*Number of tile = floor size / (length of tile * width of tile)*

Given the sample output as below, write a complete C++ code for the program. Note that the number of tiles must be integer number.
(*Hint: You may need to include a* `cmath` *library in preprocessor to use the function* `ceil()`) [4 Marks]

Sample Output

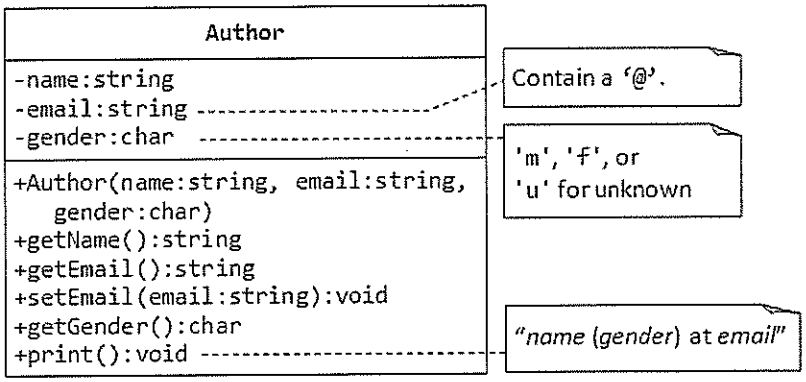
```
Enter size of your land (in meter square) : 50
Enter length and width of a tile (in meter) : 1.5  2

Number of tiles needed for 50 m^2 floor is 16.
```

Continued.....

Question 3 **[10 Marks]**

a) The following class diagram shows the design of a class called **Author**.



Complete the class **Author** containing:

i) Three private data members: name (string), email (string) and gender (character). [1.5 Marks]

ii) A constructor to initialize the name, email and gender with the given values. There are no default values for data members. Check if the value of gender is 'm' or 'f', otherwise set the value to 'u'. [2 Marks]

iii) Functions to get name, email and gender and a function to set a value for email. Noted that there are no set functions for name and gender as it is assume that these attributes cannot be changed. [2 Marks]

iv) A `print()` member function that prints the information in the following format:
"name (gender) at email"
e.g. "*Peter Jones (m) at peter@somewhere.com*" [1.5 Marks]

Continued.....

b) Read and study the following code.

```
#include <iostream>
using namespace std;
class Base{
    public:
        ~Base(){      // note: not virtual
            cout << "Calling ~Base()" << endl;
        }
};

class Derived: public Base{
    private:
        int* m_array;

    public:
        Derived(int length){
            m_array = new int[length];
        }

        ~Derived(){
            cout << "Calling ~Derived()" << endl;
            delete[] m_array;
        }
};

int main(){
    Derived *derived = new Derived(5);
    Base *base = derived ;
    delete base;
    return 0;
}
```

i) What is the output of the `main` function? [1 Mark]

ii) How does the output change if a "virtual" keyword in front of "Base" destructor is added, as the following? [1 Mark]

```
Virtual ~Base()…..
```

iii) Briefly explain why the output changes by adding the "virtual" keyword. [1 Mark]

Continued.....

Question 4 [10 Marks]

a) The code below is a class called **IDGenerator** with one static integer data "**id**". Complete the following code:

```
class IDGenerator
{
    private:
        // Here's the declaration for a static member
        static int s_nextID;
    public:
        // (i) A constructor to increase the id value
        // (ii) A static get function to return current id value
};

// (iii) Initialize value of id to 1
```

i) Write a constructor to increment the id value by one and generate the next id. [1 Mark]

ii) Write a static get function to return the current id value. [1 Mark]

iii) Set the initial value of id to 1. [1 Mark]

b) Write a C++ program to declare a vector containing character variables. The program asks the user to enter 10 characters and stores vowels in the vector. Finally, it prints the content of the vector. [3 Marks]

c) The code below is a class `Number`. Write a friend function (`printNum(Number&)`) to the class that prints the value of the variable for a current object. [2 Marks]

```
class Number {
    private:
        int a;
    public:
        void getNum(int x) { a = x;}
        //declaration of friend function here
};
//friend function "printNum" definition here
```

d) Change the following class to an abstract class. [2 Marks]

```
Class Normal {
    int x ;
    void func_normal();
}
```

End of Page.